

THE GREAT
BARRIER REEF
OF AUSTRALIA





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MATTHEW NATHAN

To His Excellency the Governor

With
Best Christmas and
New Year Wishes

From
The Premier of Queensland
and Mrs. Theodore.

December, 1923

The Great Barrier Reef of Australia

*A Popular Account of its General Nature, compiled by
the Great Barrier Reef Committee, Brisbane, 1923.*

The Great Barrier Reef Committee is composed of representatives of the various scientific institutions throughout Australia and New Zealand, and has been formed with the object of investigating the problems—both purely scientific and economic—of one of the most unique physical features possessed by Australia.

Chairman :

His Excellency Sir Matthew Nathan, P.C.,
G.C.M.G., Governor of Queensland.

Vice-Chairman and Hon. Secretary :

Professor H. C. Richards, D.Sc., Univer-
sity, Brisbane.

Hon. Treasurer: W. M. LeStrange, Esq.

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Brisbane.



PENTECOST (OR LION) ISLAND AND WHITSUNDAY PASSAGE.
(From Lindeman Island, North Queensland.)

The Great Barrier Reef of Australia.

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INTRODUCTORY.

IN the ports of Europe old sailors spin their yarns, telling tales of the wide, wide world, tales of the Southern Seas. They tell how once they sailed into the calm lagoon, beached their boat upon the yellow sand, and walked beneath the cocoanut palms to the native village. From the brown thatched houses came brown men and women—stalwart men, handsome women—who gave to their visitors strange and delicious fruits and who decked them with sweet garlands of flowers.

But behind the brightness of this picture was a gloomy shadow—the shadow of the coral. For the ancient mariners never thought of coral as a thing of beauty or romance. To them it was a horror, worse dreaded than the ice-floe or the fog or any terror of their Northern Seas. To them the coral represented a demon against whom neither skill, care, nor knowledge availed; by whom at any instant in storm or fine, day or night, their ship might be wrecked and themselves slaughtered. This demon of the coral had for his fellows two evil spirits blacker than himself—the demon of the hurricane and the demon of the man-eater. The Arctic gales which whip the North Sea in winter are gentle breezes in comparison with the hurricanes of the Tropics, which toss a ship ashore like a cork or sink her like lead in mid-ocean. Sad was the fate of the sailors who were battered

* The Committee is indebted to Mr. Charles Hedley, F.L.S., for most of the text matter.

to death on the jagged coral or smothered in the foam; but more dreadful by far was the death of those who struggled ashore alive only to fall into the hands of cannibals—to be fattened, slaughtered, and eaten like sheep or fowls. Mostly these unlucky adventurers just vanished and their sufferings were unknown. Sometimes the news of their disaster reached home after long years, as in the case of La Perouse, whose crews perished in Vanikoro when his two great warships were flung by the hurricane on the coral reef.



STAG'S HORN REEF, OUTER BARRIER.

[W. Sville-Kent, Photo.]

HISTORICAL.

When the British captured the city of Manilla in 1762, the opportunity was taken to search the old Spanish archives. One of the most interesting documents found there reported a great geographical discovery, the first passage of Torres Strait, kept a secret by the Spaniards for a century and a-half.

Torres.

In the year 1605, an expedition had started from South America to explore the South Pacific Ocean. Three vessels under Admiral de Quiros sailed westwards from Callao. After the discovery of the New Hebrides and Solomon Islands, Captain Luis Vaes de Torres separated from his companions and coasted along the Louisiades and the south coast of New Guinea. Following the land south-westwards he reported passing some very large islands about the eleventh degree of south latitude, after which he entered the Arafura Sea. Since Cape York is in south latitude $10^{\circ} 41'$, the hills of Cape York and Prince of Wales Island must represent those large islands. The honour withheld from the explorer by his own countrymen was restored by the British cartographers, who bestowed the name of Torres Strait on the passage between Papua and the Spaniards' "Tierra Austral."

Captain Cook.

The next European to visit this region was that prince of navigators, Captain James Cook. East Australia was then a blank on the map. On this blank, Cook drew 2,000 miles of coast before he joined up with the survey of Torres. June 1770, found him cautiously moving northwards, sounding and charting as he went, quite unconscious of the existence of the Great Barrier Reef that was closing in upon his track. Low Islands, where a lighthouse now stands, was his first coral island, but he could not recognise it as such or profit by the warning it conveyed. In the night of 11th June, the ship struck hard and fast on a coral reef, now called the Endeavour Reef, between Port Douglas and Cooktown. The accident was a terrible one, because the ship was threatened with destruction and any helpless survivors would have been butchered by the mainland natives. The hull was pierced by the coral and leaked badly.

As much as possible, including all the guns, was thrown overboard to lighten the ship: Fortunately the sea remained calm and the weather fine. After twenty-four hours the ship was hauled off the rocks and was "fothered," by drawing a sail underneath her keel until the leak was covered. The crippled bark was sailed across to where Cooktown now stands, emptied, laid on the beach, and repaired.



CHARTERED REEF, THURSDAY ISLAND, TORRES STRAIT.

[W. Saville-Kent, Photo.]

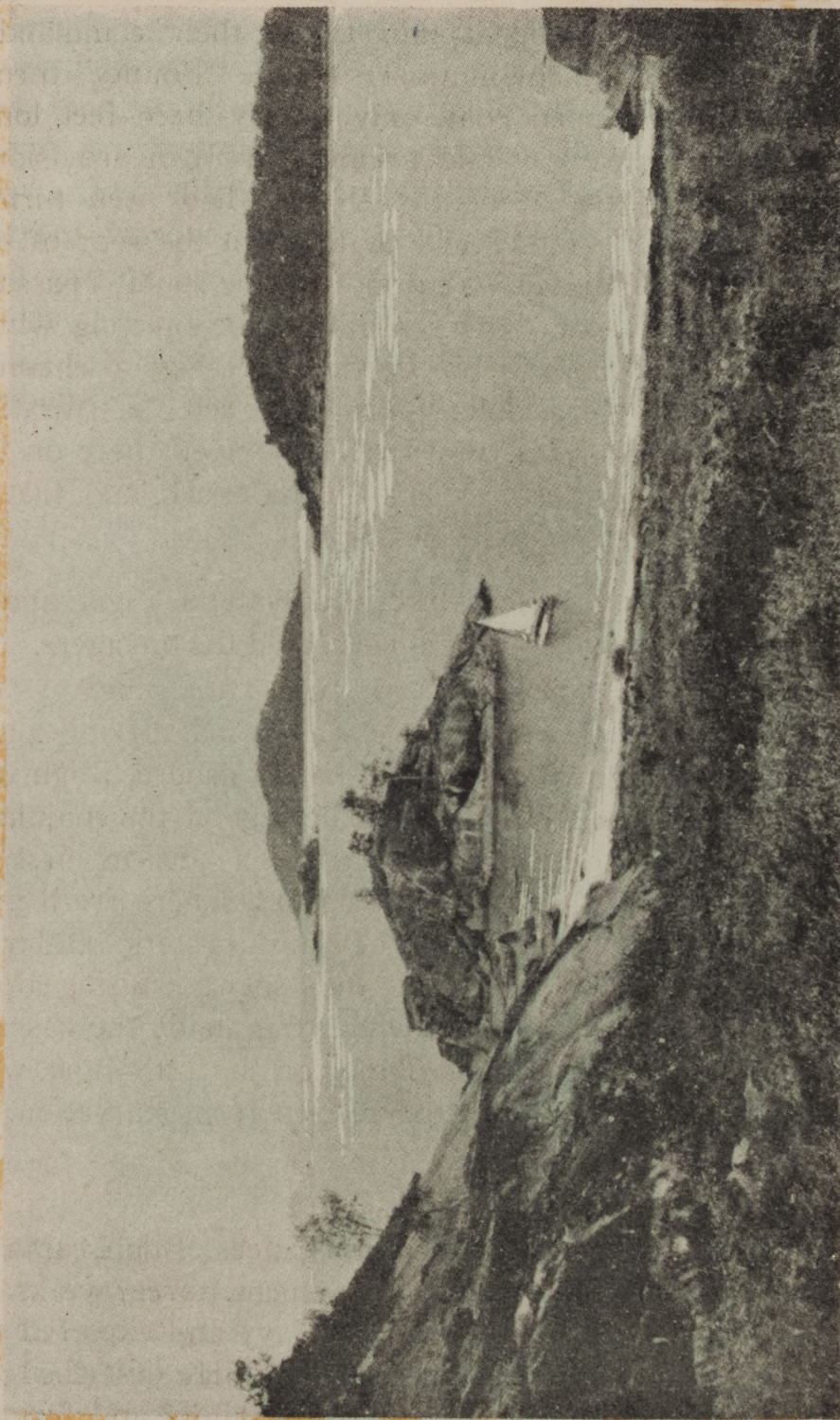
Cook ascended Grassy Hill and to his horror saw, spread like a map beneath him, a maze of reefs in every direction. When the ship was again seaworthy, Cook made all haste to reach the deep water off shore. With anxiety and care he crept out between the reefs until, from the high peak of Lizard Island, he could see a clear opening through the Outer Barrier. Cook's relief at gaining freedom from the reefs was short-lived. Three days afterwards the

ship was becalmed off the Outer Barrier. The waves carried the vessel nearer and nearer to the reef till "the ship rose on a breaker prodigiously high so that between us and destruction was only a dismal Valley, the breadth of one wave. All the dangers we had escaped," wrote Cook, "were little in comparison of being thrown upon this reef, where the Ship must be dashed to pieces in a Moment." At the last dreadful instant, "a Small Air of Wind sprung up" and pulled the ship out of the jaws of death. An opening, Cook's Providential Channel, was then reached. Glad though Cook had been to leave the Barrier, his joy at finding himself safe inside it again was far greater.



CORAL REEF, BOWEN HARBOUR, NORTH QUEENSLAND.

Another week was spent, with boats constantly ahead to signal shallow water, before he reached Torres Strait. On 22nd August, 1770, Cook landed on Possession Island, and in the name of His Majesty King George the Third took formal possession of the east coast of New Holland.



THE FAMILY GROUP, NORTH OF HINCHINBROOK ISLAND, NORTH QUEENSLAND.

William Bligh.

It was a pupil of Captain Cook, their commander William Bligh, whom the mutineers of the "Bounty" thrust overboard into an open boat, only twenty-three feet long, with eighteen companions and a scanty supply of provisions. On 29th May, 1789, a month after he had been turned adrift near Tahiti, Bligh heard at midnight the roar of the surf on the Great Barrier. Next morning he found a passage through the reef a few miles south of the opening which had proved Cook's salvation. Crossing the lagoon channel, Bligh landed on an island which he called "Restoration Island," for the double reason that he arrived there on the anniversary of the Restoration of Charles II. and that it restored him and his crew to health.

A high hill with forest to the water's edge, and a beautiful sheltered sandy beach, welcomed the voyagers. In this delightful resort, fresh water, wild fruits, and oysters were procured. A fire was made with a magnifying glass. But, after enjoying two days' refreshment ashore, Bligh was alarmed by a horde of savages gathering on the mainland opposite. Continuing his voyage, Bligh put in first at Sunday Island and then at Turtle Island, where fresh provisions were gathered in the way of clams, oysters, sea-birds, beans, and berries. A week was thus spent, cruising along the coast of Queensland, after which was made the passage of Torres Strait. He reached Timor on the 14th June, with his crew in the last stages of exhaustion from starvation.

Matthew Flinders.

Under more prosperous circumstances, Bligh came to Torres Strait again. In 1792 he spent three weeks in command of two ships of the Royal Navy and explored the whole area, mapping it for the first time. He described the islanders with admiration as "dextrous sailors and formid-

able warriors." Bligh had with him as his junior officer an explorer who became even more famous than himself, Matthew Flinders, who was destined to increase greatly the knowledge of the Great Barrier Reef.

Probably no other space of the same size was crowded with so many dangers to the mariner as the 200 miles that lay between the Pacific and Indian Oceans and between Australia and New Guinea. In the short interval between the first and second visits of Bligh, a British man-of-war



MASTHEAD ISLAND, CAPRICORN GROUP.
(Showing coral island in lagoon from reef.)

[A. R. McCulloch, Photo.]

had been wrecked there. On 25th August, 1791, Captain Edwards, in H.M.S. "Pandora," bound westward, met the Great Barrier Reef in the latitude of Cape York. Following the reef he discovered three high volcanic islands which he named the Murray Islands. The accident from which Cook had escaped so narrowly then befel Edwards. At a critical moment the wind dropped and the current drove the man-of-

war on to and over the reef. Next morning she sank in fifteen fathoms with a loss of thirty-nine men. The survivors, almost destitute of provisions and water, sailed in four boats through a new passage in Torres Strait. After suffering great hardships they arrived at Timor on 14th September.

To-day the dread of the coral reef has abated. The mazes of the reef have been sounded, measured, and mapped. Safe routes are found and beaconed by which vessels may traverse the danger zone in safety.



INSHORE REEF, PALM ISLANDS, NORTH QUEENSLAND.

[W. Saville-Kent, Photo.]

UNIQUE GEOGRAPHICAL FEATURE.

The continent of Australia, while unable to match the large rivers or high mountains of other lands, possesses one geographical feature in which it is supreme, and that is the possession of the largest coral reef in the world. This reef

extends along the coast of Queensland for more than a thousand miles. The next largest reef is that which frames the island of New Caledonia. Neither of these has received as much attention from investigators as its importance deserves.



NIGGER-HEADS ON ST. CRISPIN REEF, OUTER BARRIER,
OFF PORT DOUGLAS.

[A. R. McCulloch, Photo.]

BUILDING OF THE CORAL REEFS.

The builder of these huge structures is, to express it simply, a little lump of animated jelly, often termed the "coral insect" but more properly called a polyp. This varies from the size of a hand to that of a pin-head, and is almost exactly like a sea anemone. Corresponding to the petals of

a flower are a circle of waving arms and in their centre the stomach. As animalculæ float past and touch the polyp they are secured with tiny poison darts. When a hit is scored the victim is stung to death and in falling is caught by the waving arms and pushed into the centre of the disk, where the stomach opens to swallow the prey whole. The lime found in the food is deposited around the polyp, just as the human body uses lime to make its bones, and thus the coral rock is formed. A branch of dry coral appears as a delicate fabric of white stone pitted over with cells; on magnification each cell is seen to have a series of radial partitions. When the coral was alive a polyp sat in each of these cells, and the partitions are imprints made by its soft body. When alive a thin membrane extended from one cell to the next, so that each individual, though capable of a separate life, was one flesh with the whole colony. When alive the coral would be coloured, frequently brown, but sometimes with vivid hues of red, yellow, green, or blue.

Two conditions are particularly required for the existence of reef-building corals. In the first place the seawater must be pure; especially must it be free from mud; and in the second place it must be very warm. Though corals predominate in the upbuilding of a coral reef, a large share in the work is contributed by other things such as shells, foraminifera, and seaweeds.

THE FOUNDATION OF THE REEF.

Nowhere does dry land face deep sea; between them intervenes a bank stretching seawards for 10 to 100 miles, and sloping outwards from a depth of 10 fathoms to 100. This shallow fringe, which is called the "continental shelf," makes a step between the land and the abyss. From its outside edge the seafloor plunges down steeply and here the ocean depths commence.



HINCHINBROOK PASSAGE AND HINCHINBROOK ISLAND, NORTH QUEENSLAND.

The continental shelf of Eastern Australia is narrower in temperate than in the tropical zone, where it makes a foundation for the Great Barrier Reef. As the water becomes gradually warmer reef-building corals appear. Even as far south as Sydney small stray corals are seen, and off Moreton Bay several species occur. The southernmost place where the corals have built land is at Lady Elliot's Island in south latitude $24^{\circ} 7'$, a broad platform of solid coral half-a-mile in circumference, on which a lighthouse stands. A few miles further on the coral islets assemble in an archipelago, the Bunker Group, which passes into a larger group, called from its latitude the Capricorn Islands. Having entered the Tropics, the reefs multiply fast. The system of the Outer Barrier commences with the loosely scattered series of Swain's Reefs, about which little is yet known. Proceeding north, the Outer Barrier becomes more compact.

THE OUTER BARRIER.

From northwards of 18° south latitude there develops a succession of broad linear reefs awash at high tide; each is several miles in length and perhaps half-a-mile in breadth, and separated from the one in front and behind by a channel of half-a-mile or so. Upon their banks a mighty surf beats incessantly, even in the calmest weather. As the long rollers of the open ocean suddenly encounter the Great Barrier, they rear up into huge waves, topple, roar and crash upon the reef, spending themselves in a long smother of foam across the flat. At high tide when no obstruction is visible, the sight of the long line of boiling surf, springing up in mid-ocean without any apparent cause, is as strange as it is magnificent.

The space between the Outer Barrier and the mainland varies from 80 to 20 miles in breadth. This is a region of comparative calm, for the outer reef serves as a breakwater to exclude the ocean swell. The phrase "Great Barrier

Reef" conveys to many people an idea of a single complete structure arising out of the sea like the Great Wall of China. Perhaps it would be better if we spoke of the "reeferies" rather than of the reef, for the Great Barrier is composed of an infinite maze, and endless complex of individual reefs, different in size, shape, and spacing.

AUSTRALIA'S GRAND CANAL.

The area between the Outer Barrier and the mainland is divisible into two regions: An inner narrow zone along the land comparatively free from coral, and an outer belt overgrown with innumerable reefs. This inner zone includes the coastal highway along which pass the interstate and foreign shipping, always within sight of the mainland. Here the water is muddy from the discharge of rivers, and—the depth varies from 5 to 20 fathoms. The outer offshore zone carries a depth of from 20 to 70 fathoms; the water is clear and blue. Being thickly strewn with reefs, many of which are still uncharted, it is most dangerous to navigation. No one ventures into these intricate passages except the hardy fishermen who sail there to gather pearl-shell, trochus, or bêche-de-mer.

MOUNTAINOUS ISLANDS.

Between the inner and the outer zones stretches a string of lofty islands extending for several hundred miles from the Keppel Islands in the south to Lizard Island in the north. Rarely does a traveller lose sight of one of these high islands before another rises into view. There are places where, as in the Whitsunday Passage, vessels wind through fiord-like channels with a chain of mountain islands on either hand. Many of these islands are well wooded and watered by fine streams; they may be two or three miles in length and rise to a height of several hundred feet. Their beautiful bays and beaches beckon invitations to the wanderer.

The plants and animals of these high islands are closely related to, and usually identical with, those of the nearest mainland from which obviously they have been derived. When the sea overflowed a former coast, drowning the plains and valleys, it left peaks and ridges to project above the water in the form of existing islands. Reconstructing



GROWING CORAL IN SHELTERED LAGOON ON YOUNG REEF (Lat. $12^{\circ} 7' S.$).
(Upward limit of coral growth shown ; also effect of sediment.)

[H. C. Richards, Photo.]

the lost land, the former shore line of Queensland is indicated as buried below the Outer Barrier Reef and the former coast range is represented by the present high islands. These islands are composed of granitic or some other old rock of continental origin.

CORAL ISLANDS—ATOLLS AND CAYS.

In sharp contrast to the mountainous islands of the inner zone are the low islands outside them ; the distinction

between the two is one of kind, not of degree. The high islands are sunken granite peaks, the low are banks built up of coral. As far as the eye can reach, the features of either are recognised immediately. Descriptive names applied to such islands are "Low Island" or "Low Woody Island."

These low coral islands are termed "atolls" when they form a ring, more or less complete, of dry land enclosing a lagoon; and are termed "cays" when they are solid islands



GROWING CORAL SHOWING UPPER LIMIT OF GROWTH AND EFFECT OF SEDIMENT, YOUNG REEF (Lat. $12^{\circ} 7' S.$).

[H. C. Richards, Photo.]

without lagoons. The land is sometimes a bare sandheap; at a further stage of development the island may have a beach of coral rock, and may be covered more or less densely by low trees and shrubs. Seen on the horizon such an island forms a narrow, horizontal, black bar; a little nearer it is like a raft overgrown with bushes. As the tide falls the reef is exposed in a great plain of sand, mud, and broken coral, which extends in some cases for miles, and viewed

from the beach it stretches to the horizon. The higher points, which become islets at high water, are arranged irregularly along its margin, from which the slope plunges down rapidly to depths of five or eight fathoms.

The formation of these coral islands has given rise to long controversy and to various and complicated explanations. In some cases a granite island continued to sink till it was completely drowned, and upon that base coral has



CORAL ROCK BEING DISSOLVED AND DISRUPTED BY THE WAVES ON WINDWARD SIDE OF COQUET ISLAND (Lat. $14^{\circ} 32' S.$).

[H. C. Richards, Photo.]

grown. One writer imagined that the atoll islands began as a solid block, and that the sea dissolved away the interior, thus converting it into an atoll.

A recent theory holds that these more or less imperfect atolls have grown up from the even floor of the lagoon channel, and that they are moulded to their present form by the prevailing south-east winds, being in fact stream-lined. At first a spire of coral may have ascended to the surface. Round some such obstacle drifting masses of broken coral,

shells, and sand were packed up by the wind and waves. The islet thus formed has a crescentic shape, its back to the wind and horns directed to leeward. Every storm enlarged the original crescent by piling up further débris on the windward side, until eventually a horse-shoe form was developed. By a continuation of the same process the ends of the horse-shoe approached each other and finally united. Where the winds are normal and variable, playing first from one quarter and then from another, an atoll can never be formed. According to this explanation, the lagoon represents a space of the original foundation which is left uncovered by coral. But the existence of the lagoon is a temporary feature; the forces that built the atoll will in the course of time eventually fill up the lagoon and convert the atoll to a solid cay, over which a forest will spread at last.

LIFE IN THE CORAL.

That portion of the beach of a coral island which is exposed by ordinary tides is paved with a litter of dead and broken fragments of coral. These are strewn in confusion and often become consolidated into rock. The living reef whose wastage builds the dry land is only uncovered by an extremely low tide. It is best viewed through a water telescope when drifting in a boat, and it presents a beautiful spectacle comparable to an exquisite garden. In colour, brown predominates, but there are brilliant touches of orange, blue, red, and green. The submarine landscape is diversified by various shapes—huge hemispheres, flat tables, many-pointed antlers, shrubs, fans, and vases. Through these coral groves swim fish of quaint form and as brightly coloured as butterflies. Here and there perch sea-urchins with long spines like knitting needles or short ones like pencils. Starfish, some blue as the sky; *bêche-de-mer*, some black as ink, are scattered about; great clams with jaws a yard across gape for the unwary. As the boats drift by,

the visitor is fascinated by the wonderful shapes and colours reeled off beneath him. So vast is their population that no naturalist in the world can catalogue the furniture, or appraise the wonder, of a coral reef alive and in full bloom.

ECONOMIC WEALTH.

But the Barrier Reef has other attractions; it is the scene of several important industries which may under good management attain to larger dimensions.



QUEENSLAND PEARLS AND PEARL SHELL.

Fish.

Food fishes abound in great variety and large numbers, and no doubt in the future a great trade in these will be developed.

Pearl-shell.

For many years the most lucrative business has been that of pearling. The pioneers found great pearl-shells growing on the beaches at low water; but such shell as could be reached by wading was soon exhausted. Natives of Torres Strait were then engaged to gather by diving the shell which grew in shallow water. As the more accessible fields became exhausted, shell was followed into deep and then deeper water. Finally the divers adopted the helmet



OUTER BARRIER REEF WITH SUBMERGED BECHE-DE-MER.

[W. Saville-Kent, Photo.]

diving dress and air-pump. Thus equipped the modern pearl-sheller descends from a lugger and walks about on the seafloor, picking up what shell he finds and giving directions to his crew with a signal cord held in his hand. The shells are the property of the owner but the pearls themselves are the perquisite of the divers. From time to time the beds become exhausted by over-fishing, and the pearling fleet give them time to recover by moving to another district.

Small and handy luggers are usually employed in this trade, and the majority of the crew are Japanese. During the year 1921-1922 the export of pearl-shell from Queensland was only 4 tons, valued at £133. In past years the crop has frequently exceeded 1,000 tons.

Bêche-de-mer.

Second in importance is the trepang or bêche-de-mer industry. This creature is a sea-slug, shaped like a cucumber, about a foot long and two inches broad. It crawls about in the pools of the reef and is gathered by hand, but in deeper water diving is necessary. There are a dozen or more



CORAL DEBRIS BEING PILED UP AND LEVELLED OFF BY THE ACTION OF WIND AND WAVES ON THE WINDWARD SIDE OF COQUET ISLAND (Lat. $14^{\circ} 32' S.$).

[H. C. Richards, Photo.]

different kinds varied in shape and colour; some of these are of no commercial value, but the higher grades are worth three or four times as much as others. The bêche-de-mer are prepared for market by being boiled, gutted, and dried. At this stage the product appears like scraps of old leather. It is bagged up and sent to China, where it is esteemed as a basis of soup. In 1921-1922, 447 tons, to the value of £84,031, were exported from Queensland.

Trochus Shell.

A minor industry of recent development is the gathering of trochus shell. This is a pyramidal sea-snail, of three to four inches in diameter, striped with white and crimson bands and richly nacreous within. The shells are gathered by hand upon the coral reef; the contents are removed by boiling and picking or by rotting out in the sand. They are bagged and exported to Japan, where they are cut by machinery into pearl-shell shirt-buttons. In the year 1921-1922, 3,444 tons, valued at £14,995, were exported from Queensland.*

Sponges.

The only commercial sponge yet found on the Barrier Reef is large and coarse, unfit for use as a bath sponge, but serviceable for such rough work as cleaning cars and machinery. It grows in large black masses on the reef-flats, and when cut open looks like a slice of bullock's liver. Perhaps a higher grade of sponge may be found or introduced and cultivated in the future; the conditions under which high-class sponges are produced in Florida seem to be repeated in Queensland.

Tortoise Shell.

Both the green and the hawk's-bill or "tortoise-shell" turtle are plentiful, though neither yet ranks as a commercial product. About November the female comes to the sandy beaches of the coral islands and digs a hole with her flippers in the dry sand above high-water mark. Here a quantity of eggs are buried and left to be hatched by the heat of the sun without further maternal care, and the young under cover of darkness escape to the sea. The egg is about the size and shape of a small billiard-ball, and though good for making cakes and puddings has the peculiarity that it can

* Mr. C. H. Wickens, Commonwealth Statistician, has kindly supplied the above statistical information on marine products.

never be boiled hard. The green turtle itself supplies the favourite dish of aldermanic banquets. From the carapace of the hawk's-bill is obtained the tortoise-shell of commerce. There are several other large turtles living in these waters, none of which are of economic importance.



NIGGER-HEAD ON PIPON ISLAND (Lat. $14^{\circ} 8' S.$).

[H. C. Richards, Photo.]

Dugong.

The natives obtain a large supply of meat from these and from the dugong. This latter is a marine mammal with ivory tusks, and as large as a cow; it browses on the sea-grass. The flesh has been compared to pork, and dugong oil has been recommended for lung complaints. The dugong is too rare to provide meat for the butchering trade.

A LONELY REGION.

The mainland beaches that face the Barrier Reef are at present vacant, but will probably be utilised for cocoanut

plantations in the future. The northern end of the Great Barrier faces one of the most lonely coasts in Australia or in the world. Pioneering is not yet finished here. There are no settlements along the Cape York Peninsula for the hundreds of miles that intervene between Cooktown and Thursday Island. Some day the fine scenery and healthy climate will attract visitors from the South. No more delightful place for a yachting cruise could be imagined.



CORAL DEBRIS PILED UP ON WINDWARD SIDE OF CORAL ISLAND,
CHAPMAN ISLAND (Lat. $12^{\circ} 53' S.$).

[H. C. Richards, Photo.]

FIELD FOR INVESTIGATION.

As a field for investigation this area affords rare opportunities. The marine fauna, though one of the richest in the world, has been but little studied. The great question of how the coral reefs are formed is still to be decided. Half a century ago research in these regions was dangerous and difficult. An unarmed visitor landing on any beach in North Queensland was likely to be speared. Circumstances have changed since then. Cape York is now as safe as Melbourne.

Only the intrinsic difficulties of the problem remain to baffle the investigator. Years of travel would be required to examine the thousand miles of the Outer Barrier, the thousand miles of the mainland coast, and the myriad reefs and islands strewn between. That the problems involved are of unusual difficulty is shown by the fact that experienced observers enjoying great opportunities have reached widely different conclusions.

Geological.

It is obvious that the structure of the reef depends upon its foundation, and that to study this invisible foundation is like studying the human skeleton within the living body of a man. This branch is in the hands of the geologists. The foundation of the reef can only be deduced from borings and from physiography of mainland heights and ocean depths. To the best students such difficulties are incentives.

Zoological.

Since the Barrier Reef is built by animals, its problems are in the main zoological, and the best instrument for enlightenment would be a marine zoological station in the Tropics. Here trained observers, provided with proper equipment, could examine the coral fauna alive. It is hoped that the establishment of such a station would not only solve questions of abstract scientific interest but also matters of practical utility, and would increase employment and add to the national wealth.

Savages obtain their supplies by hunting wild animals and gathering wild fruits and roots. Civilised man increases his supplies enormously by cultivating the best animals and growing selected fruits and roots. Such cultivation depends on a knowledge of how such plants and animals breed, and how food, temperature, and disease affects them. To-day the harvest of the sea is gathered, naturally and wastefully, as savages would gather it. But a time will come when

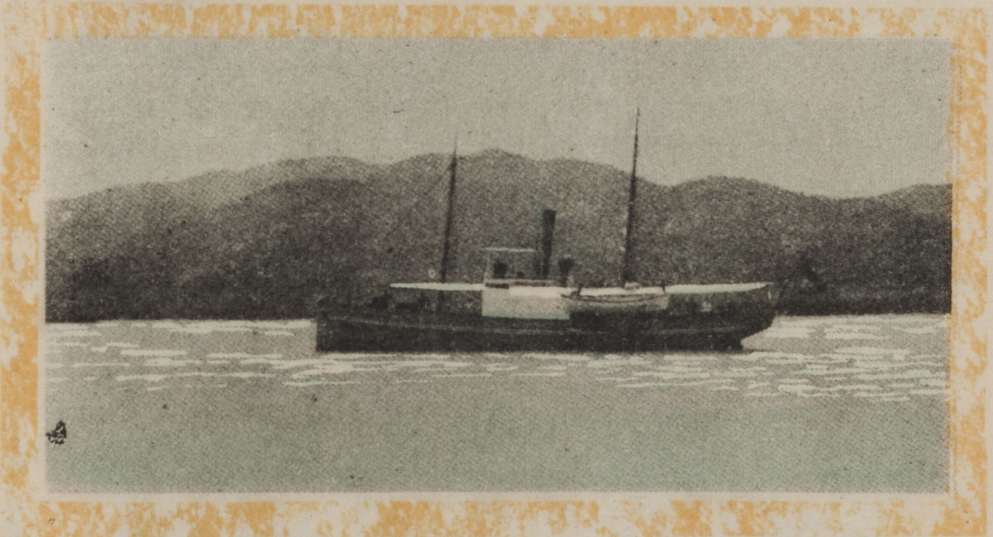


VIEW FROM LINDEMAN ISLAND, WHITSUNDAY PASSAGE, NORTH QUEENSLAND.

civilised man will multiply the fruits of the harvest of the sea by cultivation as he has done those of the land. But first the zoologists must find out by experiment and study how cultivation should proceed.

Oceanographical.

Work included under the heading of Oceanography—that is, study of the tides, currents, depths and purity of the water—can only be done on board ships that are specially equipped for the purpose. For all this knowledge we have been and probably shall continue to be dependent on the Royal Navy.



QUEENSLAND GOVERNMENT STEAMER "RELIEF" OFF GLOUCESTER ISLAND,
WHITSUNDAY PASSAGE, NORTH QUEENSLAND.

BOTANY* OF THE CORAL ISLANDS.

The flora of the low coral islands and the strand flora in general is one more or less characteristic of the Western Pacific. The history of the stocking with plants of coral islands situated some distance from any large land mass is always a subject of great fascination. The principal agents are wind, water, and birds. A characteristic feature of many

* The Committee is indebted to Mr. C. T. White, F.L.S., for the Botanical section.



PINE TREES (*Araucaria Cunninghamii*) GROWING ON GRANITE, MAGNETIC ISLAND, NEAR TOWNSVILLE.

plants of the strand is that their seeds are of a buoyant nature and adapted for dispersal by ocean currents. Thus it is that the Goat's-foot *Convolvulus* (*Ipomœa pes-capræ*) is one of the first plants to become established. This plant is widely distributed over the sand-dunes of the tropics, and is so prevalent as to have given the name of "pes-capræ association" to many ocean-beach floras in the tropics. The popular and specific names are derived from the characteristic shape of the leaves. Other creepers over the sand are *Canavalia obtusifolia*, *C. sericea*, and *Vigna lutea*—leguminous plants, the leaves of each of which are composed of three rounded leaflets.

Among the first trees to get a footing is the ubiquitous *Casuarina equisetifolia*, mostly represented in Queensland by the variety *incana*. This tree belongs to a genus of about twenty-five species, finding its greatest development in Australia, and is the only species with a wide geographical distribution, being found over most of the tropical coasts of the Old World. The fruit is a cone composed of a number of fused woody bracts, which, when ripe, open by valves at the top and shed the small nutlets or "seeds"; each of these is dark brown and has at one end a beautiful transparent wing, which aids in distribution by the wind.

As an instance of birds as agents of distribution may be mentioned *Pisonia Brunoniana*, which is abundant on some of the islands. The fruits of this tree are cylindrical and covered with a sticky, glutinous matter, by means of which they stick tightly to the feathers and legs of birds and are thus widely distributed. So sticky are these fruits that birds, particularly smaller ones, quite commonly become firmly caught in these trees and die miserably from their feathers becoming clogged up with the viscid fruits.

Pandanus trees are usually associated with the Coast Oak. A striking tree very common on the islands is *Tournefortia argentea*, easily told by the silvery sheen of its leaves. The fruits of this tree have been known to be quite sound

after floating for twelve months in salt water, showing their adaptability for distribution by ocean currents.

Other trees characteristic of the strand flora are *Hibiscus tiliaceus* (Cotton-tree), *Pongamia* (*Pongamia glabra*), *Barringtonia speciosa*, *Vitex trifolia*, and its trailing variety (var. *obovata*). *Abutilon* spp. and *Scævola Kanigii* are common shrubs in this formation. The common sand-binding grass is *Thuarea sarmentosa*; *Stenotaphrum subulatum* also occurs here and there. Succulents of the strand are *Sesuvium portulacastrum* and a Spurge (*Euphorbia atoto*). The juice of the former is said to be used by the aborigines for healing stings and also cuts and wounds; the use of the Spurges in this way is well known.

The Mangrove Flora of the reef contains practically all the Old World mangrove types. The most outstanding trees are the Red Mangrove (*Rhizophora mucronata*), easily told by its lattice-like growths of stilt roots, while the Black Mangrove (*Bruguiera*) possesses roots that travel horizontally just below the surface of the mud and every here and there develop knob-like growths (pneumatophores), whose function is to allow communication with the atmosphere and the roots in the water-clogged soil; the White Mangrove (*Avicennia*) possesses similar upstanding roots, but these are smaller and much more numerous and are commonly known as "mangrove pegs" or "cobblers' pegs." This tree is one of the few trees of the mangrove formation found outside the tropics and subtropics, extending practically speaking round the whole coast of the continent of Australia.

Other trees of the Mangrove Flora are the small Mangrove (*Ceriops*), Apple Mangrove (*Carapa* or *Xylocarpus*), River Mangrove (*Ægiceras*) and *Lumnitzera* (two species). In a few places in the extreme north the Nipa Palm (*Nipa fruticans*) is abundant. The thistle-like *Acanthus ilicifolius* and the fern *Acrostichum aureum* are also sometimes found.

